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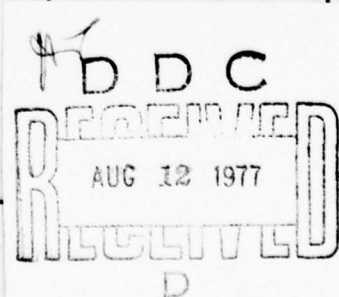
PROGRAM MANAGEMENT COURSE INDIVIDUAL STUDY PROGRAM

THE ROLE OF OPERATIONAL TEST AND EVALUATION
IN THE AIR FORCE AIRCRAFT ACQUISITION PROCESS

STUDY PROJECT REPORT
PMC 77-1

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THE ROLE OF OPERATIONAL TEST AND EVALUATION
IN THE AIR FORCE AIRCRAFT ACQUISITION PROCESS

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May 1977

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DEFENSE SYSTEMS MANAGEMENT COLLEGE

STUDY TITLE: THE ROLE OF OPERATIONAL TEST AND EVALUATION IN THE AIR FORCE
AIRCRAFT ACQUISITION PROCESS

STUDY PROJECT GOALS:

To understand DOD and AF policy on OT&E; to assess the role of AFTEC in implementing that policy; and, to provide recommendations to the program manager to ensure that a proper balance is maintained between DT&E and OT&E.

STUDY REPORT ABSTRACT:

The purpose of this report was to assess the current role of operational test and evaluation (OT&E) and the Air Force Test and Evaluation Center (AFTEC) in the AF aircraft acquisition process. Additionally, it was intended to provide recommendations to the program manager (PM) on ways to ensure adequate coverage of OT&E requirements in his program.

A trace of the OT&E policy in DOD and AF from 1970 until 1976 leads to an analysis of the new DOD draft Test and Evaluation Directive 5000.3, dated 7 March 77. This revision to DOD T&E policy emphasizes earlier operator involvement and combined development and operational testing in the acquisition process.

A series of interviews with DOD and AF officials was used to compare the current perceptions of the role and effectiveness of IOT&E and AFTEC. The AFTEC view of itself is compared with the other viewpoints expressed in the interviews. While differences exist, there is an overall similarity in perception.

Finally, the paper makes recommendations to the PM as to how he can better ensure that he includes all valid operational requirements in his test program. The areas covered are establishing the baseline, organizing and planning with primary emphasis on the latter.

SUBJECT DESCRIPTORS: Operational Test and Evaluation, AFTEC

NAME, RANK, SERVICE	CLASS	DATE
Michael J. Butchko, Lt Colonel, USAF	PMC 77-1	May 1977

EXECUTIVE SUMMARY

The purpose of this paper was two-fold: first, to investigate the evolution of operational test and evaluation (OT&E) policy in the Air Force's aircraft acquisition process and in particular the role of the Air Force Test and Evaluation Center (AFTEC); second, to provide recommendations to the program manager (PM) on how to ensure that he includes valid OT&E requirements in his program.

The methodology used was to trace DOD and AF policy on OT&E from 1970 to the present with special emphasis on an analysis of the OT&E portions of the draft DOD Directive 5000.3, "Test and Evaluation", dated 7 March 1977. This was followed by a series of interviews intended to provide a comparison of the views of AFTEC with those of other elements of DOD and the AF on the implementation and effectiveness of IOT&E and AFTEC. Finally, a series of recommendations to the PM were made relative to establishing baselines, organizing and planning for his program to ensure proper coverage of OT&E requirements.

The significant findings include the fact that the new 5000.3 will emphasize combined development and operational testing whenever possible prior to production decision and an earlier involvement of AFTEC and the user in the development cycle. The interviews determined that, despite initial conflict, there is now generally good agreement within DOD and the AF on the role of AFTEC. There is also a need to rewrite AFR 80-14 to bring it into line with the new 5000.3 and to further clarify the management relationships between the PM and AFTEC.

This paper should be useful to PMs of large or small programs in structuring their test programs to achieve the proper balance between developmental and operational tests. It can also serve to provide both developer and operator personnel with a better understanding of the interrelationship of their roles in the acquisition process.

ACKNOWLEDGEMENTS

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SECTION I

INTRODUCTION

Background

Flight test of powered, heavier-than-air aircraft has been going on in the United States since 17 December 1903, when the Wright Brothers flew what was probably the shortest successful test flight on record. In February, 1977, the Space Shuttle, piggybacked on a Boeing 747, made its first test flight. Both events were uniquely exciting. The former took the effort of two extraordinary men, the latter that of thousands of dedicated men. Between these two aviation milestones, hundreds of aircraft have gone through extensive flight test programs with varying degrees of success. While test program success has not necessarily resulted in the production of a new aircraft, an unsuccessful test program just about guaranteed that the plane would not be produced. In other words, the test program can lead to the termination of an acquisition program. If the test program identified a major fault that led to program cancellation, the test program had accomplished its purpose just as well as if it verified that the system under development was ready for production. If, on the other hand, significant problems surface after the new aircraft is in the operational units, the Air Force is accused of fielding an underdeveloped system. Conversely, as the time between Milestone 0 (Program Initiation under DOD Directive 5000.1 dtd 18 Jan 1977) and Initial Operational Capability (IOC) grows longer and more expensive, the AF is accused of testing to obsolescence. The pendulum swings back and forth. It is the responsibility of the program manager, the man charged with the development of the system, to ensure that he plans and implements an efficient and effective test program.

Purpose and Scope

The purpose of this paper is to investigate the evolution of operational test and evaluation (OT&E) within the Department of Defense (DOD) and the Air Force and to provide recommendations to the program manager (PM) that will help him ensure that valid OT&E requirements are included in his program. Emphasis will be placed on initial operational test and evaluation (IOT&E), that portion of OT&E accomplished prior to the initial production decision, and the role of the Air Force Test and Evaluation Center (AFTEC). The methodology employed is to trace DOD and AF policy on T&E since 1970 with particular attention given to an analysis of the 7 March 1977, DOD Directive 5000.3 (DRAFT). Through a series of interviews, the paper compares the views of various DOD and AF officials on IOT&E policy and AFTEC with the views of the AFTEC commander. Finally, recommendations are made as to how the PM might better ensure that valid OT&E requirements are incorporated in his program plans.

The scope of the paper is limited to the Air Force, to major aircraft acquisition programs and to the testing prior to the system production decision.

Definitions

To preclude any confusion, development test and evaluation (DT&E) and OT&E are defined as per DRAFT DOD Directive 5000.3 dtd 7 March 1977.

a. DT&E is that test and evaluation conducted to assist the engineering design and development process and verify attainment of technical and performance specification and objectives. DT&E is normally managed and monitored by the DOD components' developing agency...

b. OT&E is that test and evaluation to estimate a prospective system's operational effectiveness and operational suitability...

SECTION II

OT&E POLICY 1970-1976

The policies governing T&E have changed over the years in response to changing needs and a variety of internal and external criticisms. Since 1970, the majority of these policy changes and criticisms have been directed toward the operational aspects of testing.

In 1970 the flight test portion of the aircraft acquisition process was separated into three categories. Category I, Subsystem DT&E, was generally contractor conducted and was totally developmental in nature. AFR 80-14 defined CAT I as "development testing and evaluation of the individual components, subsystems, and in certain cases the complete system. (9:4) ¹ There were Air Force Preliminary Evaluations but these too were DT&E oriented. In Category II, System DT&E, the players changed somewhat but the emphasis did not. The Air Force, through Air Force Systems Command (AFSC), had the lead role with the contractor still heavily involved but in a secondary role. AFR 80-14 defined CAT II as "test and evaluation spanning the integration of subsystems into a complete system in as near an operational configuration as practicable." The using command became involved during CAT II by assigning the Deputy Test Director and through participation in "hands-on" maintenance with the contractor at the test site. However, CAT II was seldom "operational in nature". (3:26) The production decision

¹This notation will be used throughout the report for sources of quotations and major references. The first number is the source listed in the bibliography. The second number is the page in the reference.

for the system was generally made during CAT II. Category III, System OT&E, was the responsibility of the using command. It included "... all components, support items, personnel skills, technical data and procedures...under as near operational conditions as practicable." (9:5) Since the tests were conducted on the production item after delivery to the using command, "such testing was to determine how best to operate a system, rather than any endeavor to provide data for decision makers to use in determining whether or not to acquire a system." (21:85)

The above was the situation when the Blue Ribbon Defense Panel (BRDP) made its Report to the President and the Secretary of Defense on 1 July 1970. The Executive Summary statement relative to OT&E was direct and to the point. "Operational test and evaluation has been too infrequent, poorly designed and executed, and generally inadequate." (2:2) On the other hand DT&E was "well understood and faithfully executed...(and)... not considered to be a major problem area." (2:88) The report went on to point out that OT&E was not just physical testing but that "To be effective, OT&E must be a total process, using all appropriate methods of evaluation, which spans the entire cycle of a system from initial requirement until it is phased out of the operational forces." (2:88)

Referring specifically to the Air Force, the panel stated:

There are three principal problems with Air Force OT&E, as currently done. First, operational considerations receive much too little attention in Categories I and II. Second, the operational commands responsible for Category III and Operational Employment Testing lack both the personnel and facilities to be effective. Finally, all of the categories are too duplicative and time-consuming. (2:90)

The panel also made sweeping recommendations on organization within the Office of the Secretary of Defense (OSD). The most significant for the purposes of this paper concerned the independent OT&E agency. The wording is somewhat indirect but the meaning is clear. "The Secretary of Defense should communicate to the Military Departments...his conviction the cause of effective OT&E is best served when independent OT&E organizations report directly to the Chiefs of Service, Service Secretaries or both." (3:9)

DOD response was immediate and positive. SecDef Laird asked the services to forward their individual proposals for meeting OT&E requirements to him not later than 1 September 1970. (17:1) The results were inconclusive and resulted in a memo from Deputy SecDef Packard on 11 February 1971. He wanted an OT&E "...agency which is separate and distinct from the developing command and which reports the results of its T&E efforts directly to the Chief of Service." (18:1)

The Air Force response did not establish the independent organization but it did make significant changes. The concept of categories was eliminated and replaced with the DT&E/OT&E philosophy. Also introduced was initial operational test and evaluation to be conducted prior to the production decision. More active participation by the using and supporting commands was incorporated and the user was required to provide an IOT&E report to the production decision process. (19)

Parallel with the memorandum - response cycle, the first DOD Directive 5000.1, dated July 31, 1971, "Acquisition of Major Defense Systems" was prepared and released. Its purpose was to provide formal

acquisition policy within DOD and to establish the Defense Systems Acquisition Review Council (DSARC) and the Development Concept Paper (DCP) for major programs. No mention of direct user involvement prior to DSARC II (Full-Scale Development decision) was made. Nor was there any requirement for an independent operational test agency. It should be noted that this directive followed by five months Secretary Packard's memo calling for an independent agency. However, it was very explicit on the role and importance of the operational assessment:

Test and evaluation shall commence as early as possible. A determination of operational suitability, including logistic support requirements, will be made prior to large-scale production commitments, making use of the most realistic test environment possible and the best representation of the future operational system available. The results of this operational testing will be evaluated and presented to the DSARC at the time of the production decision. (12:5)

The Air Force had already incorporated both the spirit and the intent of 5000.1 through a Chief of Staff letter on OT&E on 1 Apr 71 which called for "operational test and evaluation...conducted by operational forces to determine operational effectiveness and suitability ...". (21:89) The reporting channel for the test results was independent of the developer and the AF felt that this complied with the intent of the DOD guidance and the BRDP recommendations.

It was not until a year and a half later, 19 Jan 1973, that specific DOD policy on T&E was formalized into DODD 5000.3, "Test and Evaluation". The Directive confirmed the existing policy that OT&E would be conducted by "operational and support personnel". (15:3) IOT&E was to be accomplished during Full-Scale Development to assist in evaluating operational effectiveness. The most significant requirement was that "one major field agency (or a limited number of such major field agencies) separate and distinct from the developing/procuring

command" be established. This agency was to report directly to the Chief of Staff and "Insure that the OT&E is effectively planned and conducted." (15:3) The OT&E was to be separate from DT&E but IOT&E could be combined with DT&E if "separation would cause delay involving unacceptable military risk, or would cause an unacceptable increase in the acquisition cost". (15:4) In either eventuality, the OT&E agency was responsible for: insuring that the tests were planned and executed so as to provide the necessary operational test data; participating actively in the tests; and separately evaluating the test results. There was no mention of the seeming conflict with 5000.1 which stated that "The development and production of a major defense system shall be managed by a single program manager..." and the split OT&E responsibility of 5000.3. This aspect will be considered further later in the paper.

The Air Force established the Air Force Test and Evaluation Center (AFTEC) as a separate operating agency on 1 January 1974, thus being the last of the three services to have an independent operational test agency. AFTEC, with its 200 personnel, was to assess the operational effectiveness, suitability and logistic supportability of new AF systems and to report the results directly to the AF Chief of Staff. The using command would continue to provide personnel to actually conduct the operational tests under AFTEC management. Thus the independent evaluating and reporting functions were established but the people actually doing the work did not change significantly. The only visible change at the test sites was that an AFTEC individual was assigned to the test force and given operational control over the using command personnel who were already in place. To say the least, the action created considerable

consternation and misunderstanding of the AFTEC role. Joint Test Force (JTF) directors saw their "test teams" being fragmented and their authority diluted. It was difficult if not impossible to draw a JTF organizational chart that really depicted the organization. A strong adversary relationship existed as a result of the new organization being imposed upon already existing and smoothly running test forces.¹ This aspect will also be pursued further, later in the paper.

DODD 5000.1 went unchanged for nearly 4½ years, while 5000.3 experienced only minor changes. The latter deleted the option of having more than one independent agency and further stipulated that the one remaining field agency would be independent of the using command as well as the developing command. The 22 Dec 1975 change to 5000.1 left intact the concept of the single program manager being responsible for development of the system and the paragraph on T&E (previously quoted) was repeated verbatim. There were no substantive changes to the document that would indicate a shift in T&E policy from the emphasis on early DT&E and IOT&E.

¹Personal observations of the author based on experience at the working level in 1974-1975.

SECTION III

CURRENT OT&E POLICY

DOD Directive 5000.1

Major changes occurred approximately one year later when the new 5000.1 titled "Major Systems Acquisition" was issued on 18 January 1977. Its purpose was to implement OMB Circular A-109, also titled "Major Systems Acquisition", dated April 5, 1976, and to update DOD policy on acquisition management. Considerable discussion on the role of the program manager is included. It serves to further emphasize his overall responsibility for the development of the system. The T&E paragraph had two changes. Without defining the terms, the Directive added the requirement for "An estimate of military utility and of operational effectiveness..." to those of operational suitability and logistic support requirements. (14:8) Significantly, the new T&E paragraph deleted the requirement that the operational test results be presented to the DSARC at the time of production decision. The former change appears to be a direct quote from the January 1973 DODD 5000.3 and is not significant. The latter was clarified in a subsequent interview with DDR&E (T&E) officials. The change reflects the decentralization trend called for in OMB Circular A-109. The IOT&E results are now to be reported to the Service SARC (AFSARC) which is to be chaired by the Service Secretary or Assistant Secretary. He in turn will report the combined DT&E/OT&E results to the DSARC as appropriate.

DOD Directive 5000.3

While the new 5000.1 has little impact on T&E, the subsequent

revision of 5000.3 contains major policy changes. Some of these changes appear to stem from the April 2, 1974 Defense Science Board (DSB) "Report of Task Force on Test & Evaluation". (The reader is encouraged to obtain a copy of and review the DSB report as it contains valuable guidelines on T&E.) In testimony before the R&D Subcommittee of the House Armed Services Committee on 16 March 1977, General Lotz¹ stated that "...we are making changes in our test and evaluation policies and directives to emphasize the need for conducting operational testing earlier in the development cycle of a weapons sytem." He went on to state four reasons for the need for earlier OT&E:

a. In considering system concepts during the early stages of a program, we need to know not only whether they are technically feasible but also whether they are operationally viable or tactically sound.

b. In order to have any impact on the research and development phase of a program, OT&E should be conducted much earlier than at DSARC III since by then most R&D resources will have been expended.

c. The earlier in the development cycle a deficiency is identified and corrected, the less the cost of that action.

d. A trend toward initiating limited production before the major production decision results in a commitment of procurement funds prior to the major production decision. (20:9-10)

An analysis of the 7 March 1977 draft revision to DODD 5000.3 revealed the following significant changes relative to planning, timing and reporting of OT&E. In general, the directive requires that the "critical issues, test criteria and measures of effectiveness related to the satisfaction of mission need shall be established prior to the commencement of tests." (16:2) Further, it requires the establishment of a management

¹ Lt General Walter E. Lotz, Jr., USA (Ret) Deputy Director (T&E) Office of the Director of Defense Research and Engineering (DDR&E).

reserve in both schedule and funds to cover contingency testing in case significant test objectives have not been met. (16:3) The term "management reserve" is not used but the intent is clear.

More specifically, OT&E is directly related to the modified milestone concept and the requirements to assess the system's vulnerability and its capability against enemy countermeasures are added. The 1973 policy did not call for OT&E until in the Full-Scale Development Phase. The 1977 policy requires IOT&E to begin in the Conceptual Phase following Milestone 0, to assess the operational impact of the alternative technical approaches. IOT&E will continue in the Demonstration and Validation Phase "to provide information relative to projected operational effectiveness and suitability of the candidate system design concepts. (16:6) Significantly, these IOT&E results may (as opposed to will) be considered at Milestone II and for any commitment of funds for long lead items or limited production. The previously specified Full-Scale Engineering Development Phase involvement remains the same except that the IOT&E report to support the production decision will be made to the AFSARC instead of the DSARC.

AFTEC is now directed to participate in DT&E planning to determine what portion of DT&E will contribute to the accomplishment of OT&E objectives. This early coordination should serve to reduce duplication of effort, minimize required test resources and provide maximum data that will satisfy common needs of the developer (AFSC) and AFTEC.

A subtle wording change relative to combined DT&E and IOT&E testing has put a more realistic emphasis on the issue in these times of tight

money. The 1973 directive stated that "Operational testing should be separate from development testing. However,...(they)...may be combined where separation would cause delay,...or would...increase the acquisition cost of the system." (15:4) The new directive modifies the statement to say "Development testing and operational testing may be combined.. ..". (16:8) The remainder of the words are essentially the same but the emphasis is shifted to combined testing by stating it first. Interviews with DDR&E officials confirmed the intent of the change. However, a sentence added at Navy insistence clouds the issue slightly: "As a normal practice the operational tests supporting a production decision will be conducted independently by the OT&E agency." (16:9) Despite this add-on, the availability of resources will always be the final determinant. But the emphasis is definitely shifting toward the combined testing concept as being the most efficient and cost effective method of T&E. The key is to ensure that the combined tests are planned and executed to realistically provide the necessary test information; that AFTEC participates actively; and that AFTEC conducts a separate evaluation of the test data.

The 1974 DSB report stated that IOT&E "tests should not be conducted until the primary objectives of the DT&E have been met." (5:4) In an apparent partial response, the new 5000.3 calls for AFTEC to "Monitor and review the results of DT&E...to assess the readiness of the system for operational testing." (16:7) Close, early involvement of AFTEC in the acquisition process should reduce the inevitable debate between the engineer who is never finished and the operational tester who is anxious to start.

There is an increased emphasis placed on the timely preparation of the T&E Master Plan (TEMP). Up to now it had to be prepared "prior to initiation of Full-Scale Development" and was to "integrate the effort and schedules". Now it must be prepared not later than 120 days after Milestone I and "should identify and integrate objectives, responsibilities, resources, and schedules for all T&E to be accomplished..." (16:13) This requirement alone would result in earlier involvement of AFTEC because without its participation the TEMP would be incomplete. The same emphasis is put on the test portion of the DCP (now called Decision Coordinating Paper). AFTEC inputs will be required to prepare a complete DCP.

There are many other changes in overall T&E policy in the 1977 version of 5000.3. They are, however, beyond the scope of this paper and are left to the further investigation of the reader as required.

AF Regulations

Air Force policy on T&E has not had time to react to the new DOD policies. The AF T&E policy regulation, AFR 80-14, and the AFTEC regulation, AFR 23-36, are both mid-1976 documents. The most current element is the AFSC Supplement to 80-14, dated 3 January 1977.

Two key elements of the current 80-14 are the relationship between the program manager and AFTEC and the conduct of combined testing. "The program manager has overall responsibility for a system acquisition program (except the management of OT&E)." (1:3) He will include OT&E requirements in the test program and support OT&E as appropriate. "AFTEC has responsibility for managing the OT&E in a major acquisition program... AFTEC will plan, direct, conduct, control, and independently evaluate

and report on OT&E." (1:3) This potential conflict of roles will be covered further in the interview section of this paper.

Paragraph 17 of AFR 80-14, "Conducting a Combined Test Program" seems to negate any sort of team concept in combined testing. The planning aspects of the paragraph conflict with the new 5000.3 in that they call for separate DT&E and OT&E test plans with the program manager responsible for integrating the OT&E plan. Joint planning is not mentioned. The separation of roles and functions continues down to the "joint" test force (JTF). AFSC appoints the test force director who is responsible for DT&E, integrating combined test events, insuring availability of resources and insuring the safety of the test program. AFTEC, on the other hand, will provide the OT&E test director who manages the OT&E portion of the combined program. Previously this function was performed by the user detachment commander serving as Deputy JTF Director as opposed to "OT&E test director." Thus there is one JTF with two directors - a situation that is difficult to depict on an organizational chart and which tends to splinter the "test team". AFSC Supplement 1 to 80-14 attempts to improve the situation by stating that "This test force must be able to function efficiently as an entity to accomplish overall program test objectives; management relations must be clearly defined". (Underlining added for emphasis) (1:3)

Unfortunately neither 80-14 nor AFSC Supp 1 specifies one individual who has overall test program responsibility. AFR 23-36 generally follows the guidance set forth in AFR 80-14. Appropriate Air Staff agencies are aware of the difficulties with the combined test program guidance and hopefully will provide improved guidance in the next revision of 80-14.

AFTEC has been in existence for more than three years. Initially there were serious growing pains as this new organization was imposed upon on-going programs. An adversary had been thrown into a predominantly advocate environment. Very few individuals really understood the role of the independent test agency. The situation has now had time to settle down and AFTEC is fully operational. In fact, sixty additional personnel were recently authorized. The AFTEC FY1978 budget calls for \$17.9 million in 3080 (Other Procurement), 3400 (O&M) and 3600 (RDT&E) money. This is more than double the \$8.46 million FY1976 budget and the size of the budget is expected to continue to rise.¹ No figures were available on the cost of AFTEC managed OT&E but it can be assumed to be significant since approximately 15% of the annual DOD RDT&E cost for weapons systems is used for test and evaluation. (20:2)

¹ Telecon with Mr. H. Jensen, AFTEC, Plans and Resources, Kirtland AFB, N.M.

SECTION IV

COMPARATIVE VIEWS ON OT&E

With the relative significance of AFTEC and OT&E established, a series of structured interviews were conducted to determine the current view of OT&E in the Air Force. These interviews, through a series of nine questions, compare the views of various DOD and AF officials with those of the AFTEC Commander. Officials from both DT&E and OT&E organizations were interviewed as well as senior DD(T&E) officials.

To determine the reason behind reissuance of DODD 5000.3, a separate question was asked of Admiral Kollmorgen. "Why was a new 5000.3 required at this time?" The primary reason was to get OT&E started earlier in an attempt to establish the operational environment while the design engineers were still working the design on paper. In this way there would be better assurance that the design would consider the operational environment and not just the performance specification. A second reason was to encourage combined DT&E and IOT&E testing and common use of the test resources and test results. (25) The draft 5000.3 seems to be following this intended path.

The approach used to analyze the interviews was to determine if a consensus of opinion existed on the issues and then compare the results with AFTEC's view. It should be noted that the interviewees were expressing their personal opinion and not necessarily Air Force or DOD policy.

1. DODD 5000.1 calls for a "strong SPO to achieve program objectives". AFR 80-14 says that the PM has "overall responsibility" except for OT&E. Does this in effect dilute the PM's authority?

With minor reservations, the consensus was that there is no significant problem with this concept at this time. The view was that since the PM has control of the resources of the program, dollars and the test articles, he is in a strong negotiating position when the original test plans are being developed. His task is a delicate one that requires diplomacy and tact in establishing effective working relationships with AFTEC. The same reasoning applies at the JTF level where the split roles are also evident. The JTF Director has the necessary authority he needs through his "ownership" of the test articles and responsibility for safety of operations. It is important to maintain the concept of independence but not at overall program expense. In the final analysis, as Admiral Kollmorgen stated, the golden rule applies: "He who has the gold, rules." (25) Therein lies the authority that the PM needs and that he can use as appropriate.

The AFTEC Command, Major General Leaf, views this issue in a similar fashion. Rather than viewing the PM's authority as being diluted, he sees the situation as merely an affirmation of the differing roles of DT&E and IOT&E. The former being specification oriented and the latter being oriented toward the operational environment. Furthermore, because of the complementary nature of DT&E and IOT&E, the PM's ability to produce an operationally effective and suitable system is enhanced.

As AFTEC has matured and the rest of the AF has gained a better understanding of its role, significant conflicts in this area have diminished. However, as Mr. Boykin stated, the issue should be put into clearer context in a subsequent change to DODD 5000.1, the basic

acquisition management directive, and AFR 80-14. Further definition would preclude problems from reoccurring as personalities involved change.

2. How much should IOT&E requirements influence total Full Scale Engineering Development test schedules and the Milestone III date?

There was no clearcut answer to this question. Since all programs are different, the effect will be different. The common thread throughout the responses was that well planned, achievement oriented program (vice time-schedule oriented) would have no problems with the DSARC process. There is a danger of unnecessary program stretchout if the test program is not well structured since the requirement for an IOT&E input to the production decision process is a firm one. Both the PM and AFTEC must realize that IOT&E is not an end itself but rather it is one of the means to the end objective of selecting the correct production decision. When the areas of risk have been adequately addressed, go for production, don't continue to test to obsolescence.

Again AFTEC concurred by emphasizing that there should be no adverse influence if the IOT&E requirements are integrated into the program early and are properly reflected in the Statement of Work and the contract.

3. Have we swung from too little to too much testing (DT&E or IOT&E) prior to Milestone III?

There was wide disagreement on this one. Interestingly, the developer oriented responses indicated that we were doing too much testing or at least leaning that way. There was also a feeling that, regardless of amount, the areas of emphasis need to be scrutinized closely. There was a concern that overemphasis on IOT&E at the expense of DT&E was dangerous and that developmental "show stoppers" could be

missed. The best summation in this area is that the system should be developed first and the concept of combined developmental and operational testing (with independent evaluation) be used to the maximum extent practicable.

The AFTEC response quoted the 1977 Defense Science Board report: "There appears to be little or no overtesting done under the DOD directives; what testing is done contributes its full value to the improvement and verification of system performance." (6:4)

4. Should the cost of IOT&E be borne by the SPO?
Wouldn't putting it in the AFTEC budget provide truer figures on the actual cost of OT&E?

This issue was not considered a significant problem by the majority of interviewees. All but one felt that the system should remain as is since it preserves the PM's negotiation position through his control of the resources required for the IOT&E program. Furthermore, if all funding control were transferred to AFTEC there is a real danger of creating an "operational monster". The present system allows for checks and balances.

AFTEC has picked up some of the IOT&E costs previously funded by the PM. These are command and special support IOT&E costs. General Leaf sees no need for his organization to assume any of the additional costs of IOT&E and agrees that it is not a significant problem.

5. What are we getting now in terms of operational assessment that was not available prior to 1974 when AFSC and the users were working together? In other words, what new contribution is AFTEC making?

6. The AFTEC budget projection for FY 1978 is \$17.9 mil. and will be higher in the outyears. Do you feel that we are getting our money's worth?

The only apparent consensus on these two questions was that AFTEC's main contribution was its independent test report to the Chief of Staff and the AFSARC. Otherwise, the responses were mixed. Some felt that AFTEC's contributions were very worthwhile but that their cost effectiveness had not yet been proven. Others felt we were doing just as well prior to AFTEC's involvement. Whether or not AFTEC's contribution is cost effective will not be known until someone can determine a way of measuring costs avoided due to AFTEC's input. Any deficiency found early enough to correct during production instead of through retrofit equates to costs avoided. In the future, it may be possible to develop a means to compare the number of post-production changes before AFTEC (1974) and after AFTEC. Only then can some statistically valid measure of cost effectiveness be made. But until then, the AFTEC contribution is recognized as significant in the AF and at DOD and Congressional levels.

The AFTEC response reinforced the positive aspects of OT&E in the acquisition process by citing several specific contributions. In addition to the reporting aspect, the contributions include:

- a) revision of the deficiency reporting process and providing better visibility, prioritization of deficiencies, and identification of potential fixes through coordination with the developer and the user;
- b) standardization of OT&E planning, criteria, execution and support as well as evaluation methodology;
- c) improved software evaluation through the use of a software evaluation group;

d) earlier involvement of OT&E personnel in program at PM and contractor facilities; (It should be noted that user personnel were co-located at both PM and contractor facilities on the B-1 program prior to AFTEC's inception in 1974.)

e) improved logistics and manpower assessments and operations and support cost estimates.

From a cost effectiveness (cost avoidance) standpoint, the early identification of problems when they are still relatively cheap to fix is most significant. The example of the F-15 production radar is a case in point. Major General Leaf pointed out that the APG-63 production radar would not have been fixed without AFTEC having surfaced the problem at high levels in the AF.

7. AFTEC has been criticized as a 'nay sayer'. Is this a valid criticism?

Initially, the AFTEC reports seemed excessively negative and without balance. The interviewees generally agreed that this had been true but that it was no longer a significant factor. They felt that AFTEC personnel have matured in the job and that they, as well as the rest of the AF, have a better understanding of their role. They agreed that AFTEC should be objective - neither success nor failure oriented - and should present a balanced report. There remains the danger of the IOT&E comments being taken out of context outside of the AF. This latter danger makes the need for balanced objectivity even more important.

The AFTEC response agrees with the above. The AFTEC charter calls for evaluation without bias or prejudice. The objective is to provide an operational assessment that highlights both the positive and

negative aspects of the system being evaluated.

8. Does it really matter who gathers the flight test data (developer or operator) if the test conditions are operationally representative?

This has been an emotional issue. In some programs, such as the B-1 and F-16, the "negotiations" reached the general officer level to determine the required mix. In an unlimited resource environment there would be no issue since IOT&E and DT&E can be clearly separated. In combined programs with limited resources it is significant. The DDR&E (T&E) view is that you "can't have an operational test if it is all done by developers." (25) Others felt that a data point was a data point. But overall, there was agreement that the operational pilot has a different perspective than that of the trained test pilot who has been out of the operational environment for a number of years. Qualitative assessments by both developer and user pilots are required for a balanced evaluation. Another aspect was colorfully tagged the "hamburger" factor. (23) Pilot skills vary. If only test pilots and the best operational pilots evaluate the new aircraft, they might unconsciously compensate for a characteristic that a pilot of lesser skill would find unacceptable. Thus there is a need for a mix of pilots. The PM and AFTEC must jointly agree on the proper mix.

From the standpoint of pure performance and flying qualities data taking, AFTEC sees no requirement to specify who flies the points since they are quantitative in nature. But this is not true for the operational effectiveness evaluation. For IOT&E, the user input is mandatory. Thus AFTEC concurs with the overall consensus of opinion.

9. AFTEC currently is limited to "managing" the IOT&E program. Should it also have the capability to "conduct" IOT&E as does its Navy counterpart?

The unanimous response to this final question was "no". Such a concept would inevitably lead to another "super organization" or "operational monster" that the Air Force cannot afford, that would be redundant, and that would absorb a lot of the MAJCOM efforts that rightly belong to them for follow-on OT&E. Further studies may come up with a better system than currently exists but the current concept is considered much better for the AF than the Navy approach of a separate operational test and evaluation force.

Not surprisingly, the AFTEC response was in complete agreement with the unanimous response noted above. It pointed out that the current concept is in concert with the new 5000.3. Since the AFTEC test team personnel are "borrowed" from the using commands they are more current in operational matters than they would be if they were assigned to an independent agency. There is, as a result, less danger of their becoming "professional testers" and losing sight of their role. Furthermore, the sharing of test resources fosters combined DT&E/IOT&E testing which is inherently more cost effective if done properly.

SECTION V

INCORPORATING OT&E INTO THE PROGRAM

Regardless of the variety of opinion on the utility and effectiveness of AFTEC in the acquisition process, the fact remains that AFTEC is here. The AFTEC contribution is highly visible and time sensitive in the decision process. A senior official stated that "If you have good people trying to do a good job, it comes out right". This may be true, but in the final analysis it is the program manager that is held responsible for the program outcome. How effectively the valid operational requirements are incorporated into the program will be a major determinant of the program outcome. What can the program manager do to ensure that all valid operational requirements are adequately covered in his program?

The answer to this extremely important question can be broken down into three major areas:

- 1) Establishing the baseline
- 2) Organizing
- 3) Planning

Establishing the Baseline

Establishing the baseline involves a number of elements. First of all, know the significant DOD Directives and AF Regulations. These include DODD 5000.1, 5000.2, and 5000.3. DODD 5000.1 for overall guidance; DODD 5000.2 for the Milestone checklists and DCP content; and DODD 5000.3 for the specific DOD T&E policy. AFR 80-14 and AFSC Supp 1 are also key. AFSCP 800-3, "A Guide to Program Management", is also an excellent reference. Second, know the operational concept for the system. This is the key baseline. It has to be included in the system design as well as the test plan. It will serve as the criteria against which the system

effectiveness is measured. A new AF policy for initiating, developing, updating and approving operational concepts for new and improved major systems is being considered and the PM has to be involved if the system he is developing is to meet the need. Figure 1 depicts the flow of the operational concept. (29:12B) The Required Operational Capability (ROC) has always been part of the system documentation. It leads to the Mission Element Need Statement (MENS) which is a new requirement under DODD 5000.1. The PM needs to be intimately familiar with both the ROC and the MENS. The proposed operational concept will be a dynamic document tied to program milestones for update and refinement. AFSC supports this concept and the requirement for approval of operational concept changes to preclude inadvertant breaches of program thresholds. The concept format contains operational thresholds, forces, standards for development, organization, basing and support, and significantly, the updated baseline for system design and T&E. The benefits for the PM from this concept are; that it will provide a forum for improved dialogue between his organization, the user, supporter and AFTEC; it will improve means to ensure that the system design reflects the operational concept; and ensures corporate reviews for changes. In the words of Lt Colonel Delligatti: "The corporate inputs to the initial and subsequent updates of the operational concept provides the user, developer, supporter and tester a voice in the operational concept. With this approach, the system design will reflect the operational concept. At initiation and each update, the operational concept document is required to go to all applicable agencies for review and comment prior to being submitted by the user to

AF/XO for Headquarters USAF approval. The proposed operational concept directive will provide a means to ensure that the operational community complements the system acquisition process and help to ensure that we get the best system for the money." (29:12B) Whether or not the above system becomes official AF policy, it is the type of approach that the PM should use to ensure that all parties concerned with his system are working from the same baseline.

Third, establish the critical questions and issues to be addressed in your test program. This will require coordination with such organizations as DDR&E(T&E), AF/RD and XO, AFSC and AFTEC/Using Command. These will be the questions that the PM will have to address at the program Milestones to gain approval to proceed to the next phase of the development cycle. They will be reflected in the DCP (refer to DODD 5000.2), the Test and Evaluation Objectives Annex (TEOA) of the Program Management Directive (refer to AFR 80-14), the Test and Evaluation Master Plan (TEMP) (refer to AFR 80-14/AFSC Sup 1) and the PM's own Program Management Plan (PMP) (refer to AFSCP 800-3).

Organizing

The PM cannot accomplish all of the above tasks without the assistance of a strong organization composed of the right people. The key man will be his Director of Test and Evaluation. For an aircraft program, this individual should be a qualified test pilot who is current in similar type aircraft. It should be a rated position and require attendance at the Executive Refresher Course at the Defense Systems Management College. The test office should be sufficiently manned to be the single voice of test for the PM and should be responsible for all ground and

PROPOSED OPERATIONAL CONCEPT ROLE

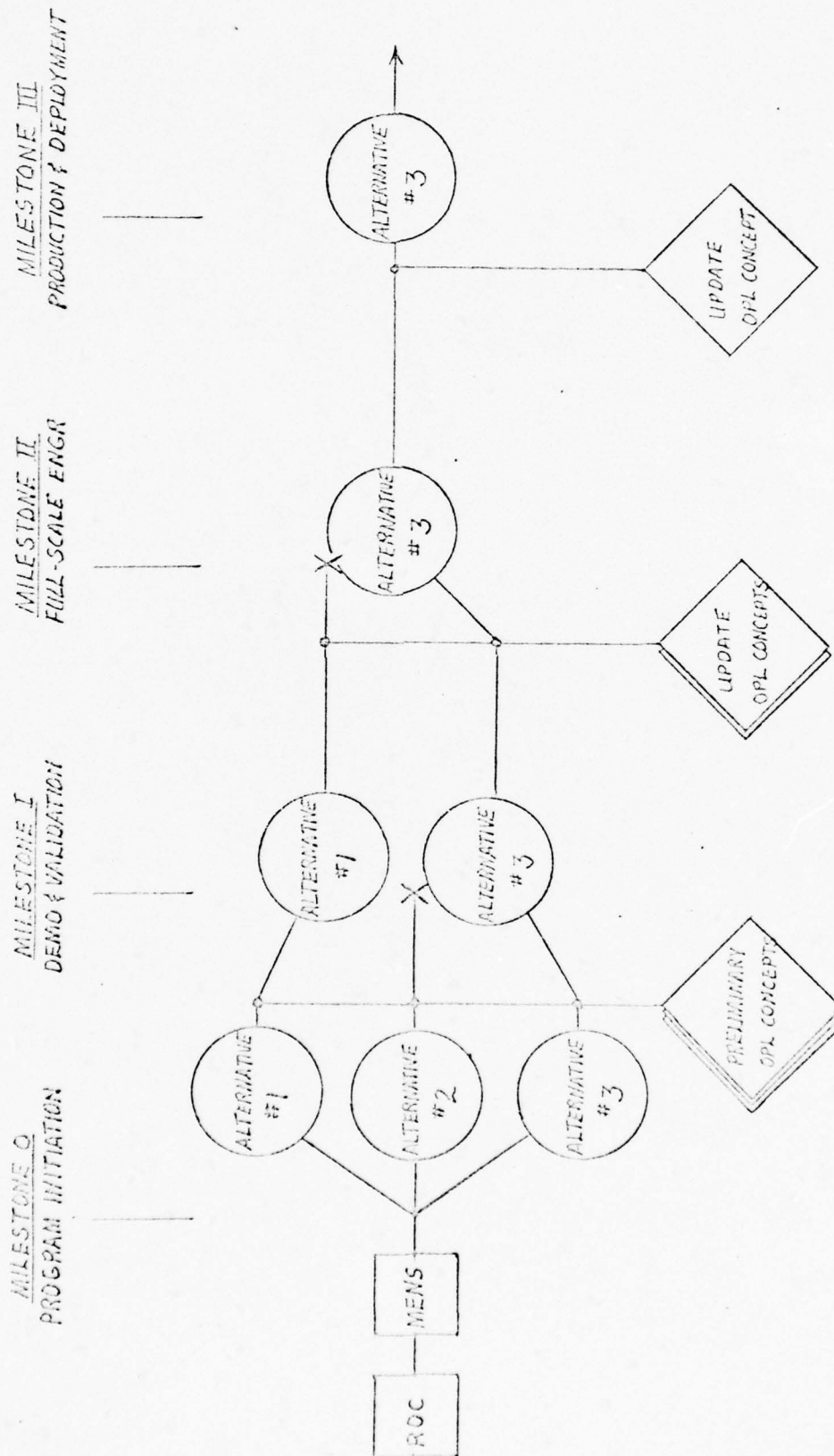


FIGURE 1

flight tests throughout the program to preclude conflicting guidance to the contractor.

Planning

With the test office as the core, the PM should form the Test Planning Working Group (TPWG) in accordance with AFR 80-14/AFSC Sup 1. This group should include all agencies that will be involved in the test program; the responsible test organization (RTO), AFTEC, the using and supporting commands, and the system contractor if already identified. The TPWG concept worked well in the past before it was required by 80-14. It was used extensively and very successfully in the B-1 test program. It provided the necessary forum for all test related subjects ranging from establishing objectives and baselines to defining organizational responsibilities. With the combined inputs of all organizations along with the operational concept and critical issues, the TPWG can prepare the draft TEMP, TEOA, and the test portion of the PMP and DCP. It will also be involved in the preparation of the detailed test plans whether or not the contractor is assigned primary planning responsibility.

The PM has to be directly involved in this planning process. Based on his program charter, he must provide specific guidance to his Director of Test. While the PM is responsible for integrating the IOT&E requirements into his program, he should not blindly accept them. He must question all requirements and changes to requirements to verify their validity and need. He should ensure that the requirements are listed and prioritized as specific objectives rather than as percentages of flying hours or missions. He must ensure that the aircraft is adequately developed through the accomplishment of prioritized DT&E

objectives before jointly agreeing with AFTEC that the system is ready for IOT&E. Finally, he must ensure that the output of the planning process is a jointly developed strategy that is agreed to by all parties concerned. It is only through a coordinated, program oriented plan that the PM can ensure that he will not be surprised later in the program by a previously unidentified requirement that is either out of scope or severely impacts his schedule or both. The earlier in the program that he can gain this confidence the better off both he and his program will be. Finally, he will have complied with both the spirit and the intent of DODD 5000.3 through his early incorporation of the IOT&E requirements.

SECTION VI

SUMMARY

In summary, this paper has looked at the criticisms and changes in DOD and AF policy on operational test and evaluation from 1970 through early 1977. It analyzed the new 5000.1 and the soon to be released draft 5000.3. Through a series of interviews, it compared the views of various DOD and AF elements on the effectiveness of AFTEC with AFTEC's view of itself. Finally, the policies and views were combined into recommendations for the PM to follow to ensure that the valid operational requirements are included in his program. Each program is different and no universal set of guidelines can be developed that will apply to them all. But the aware PM will consider them all and tailor the tactics to his specific situation. In that way he can be as assured of success as anyone can in the changing political and military environment of today's world.

APPENDIX A

DOD Directive 5000.3 (DRAFT), 7 March 1977



D R A F T

March 7, 1977
NUMBER 5000.3

DDR&E

Department of Defense Directive

SUBJECT

Test and Evaluation

- Refs:
- (a) DoD Directive 5000.3, "Test and Evaluation", January 19, 1973 (hereby cancelled)
 - (b) DoD Directive 5000.1, "Acquisition of Defense Materiel", January 18, 1977
 - (c) DoD Directive 6050.1, "Environmental Considerations in DoD Actions", March 19, 1974
 - (d) DoD Directive 4650.1, "Management and Use of Radio Frequency Spectrum", December 13, 1974
 - (e) DoD Directive 5000.2, "Major System Acquisition Process", January 18, 1977
 - (f) DoD Directive 3200.11, "Use, Management and Operation of Department of Defense Major Ranges and Test Facilities", June 18, 1974

I. REISSUANCE AND PURPOSE

This Directive establishes policy for the conduct of test and evaluation by the Military Departments and Defense Agencies (hereinafter referred to collectively as "DoD Components") in the acquisition of defense systems (Sections II through V). In addition, it defines the responsibilities of the Deputy Director of Defense Research and Engineering, Test and Evaluation (Deputy DDR&E(T&E))(Section VI). Reference (a) is hereby superseded and cancelled.

II. SCOPE AND APPLICABILITY

The provisions of this Directive encompass major defense system acquisition programs as designated by the Secretary of Defense (described in Section II. of reference (b)) and apply to all DoD Components that are responsible for such programs. In addition, the management of programs not designated as major system acquisitions shall be guided by the principles set forth herein.

III. POLICIES AND PRINCIPLES

A. General.

1. Test and evaluation shall be commenced as early as possible and conducted throughout the system acquisition process as necessary to assess the acquisition risks and to evaluate the operational effectiveness and operational suitability of the defense system being developed. Meaningful critical issues, test criteria and measures of effectiveness related to the satisfaction of mission need shall be established prior to the commencement of tests.
2. Acquisition schedules, financial plans, and contractual arrangements shall recognize that decisions to commit significant added resources to a program shall be based, inter alia, upon successful accomplishment of test and evaluation objectives which bear a meaningful relationship to required operational capabilities.

3. Schedules and funding commitment shall be established to permit additional (contingency) testing when significant test objectives have not been achieved during a planned test or test series, but a determination is made to continue with the program. Such additional testing, with positive results, may be required to support a decision to commit significant additional resources.
 4. Before the initiation of development of a new system, test and evaluation using existing systems, or modifications thereto, may be appropriate to help define the military need for the proposed new system and to estimate its operational effectiveness and operational suitability.
- B. Development Test and Evaluation (DT&E). DT&E is that test and evaluation conducted to assist the engineering design and development process and verify attainment of technical performance specifications and objectives. DT&E is normally managed and monitored by the DoD Component's developing agency, which reports the results to the responsible Military Service Chief and Service Secretary, or Defense Agency Director.
1. DT&E includes testing of components, subsystems, related software, and prototype or preproduction models of the system. In addition, compatibility and interoperability with existing or planned equipments and systems shall be tested.

2. During the development phase following the Program Initiation Decision (Milestone 0) adequate T&E shall be accomplished when appropriate to select preferred alternative systems concepts.
3. During the development phase following the Demonstration and Validation Decision (Milestone I), adequate DT&E shall be accomplished to identify the preferred technical approach and to demonstrate that technical risks have been identified and that solutions are in hand.
4. During the Full-Scale Engineering Development Phase and prior to the first major production decision, the DT&E accomplished shall be adequate to insure: that engineering is reasonably complete; that all significant design problems (including vulnerability, compatibility, interoperability, reliability, maintainability, and logistical considerations) have been identified; and that solutions to these problems are in hand.
5. During full-scale production, subsequent to the Milestone III decision, DT&E will be an integral part of the development, acceptance, and introduction of:
 - a. Product improvements into the produced system.
 - b. Operational characteristic changes to meet identified threat changes.
 - c. Changes to reduce system life cycle costs.

6. For those systems which have an interface with equipment of another DoD Component or may be acquired by two or more Components, joint DT&E may be required. Such joint testing will include participation and support by all affected Components as appropriate.

- C. Operational Test and Evaluation (OT&E). OT&E is that test and evaluation conducted to estimate a system's operational effectiveness (including vulnerability) and operational suitability (including compatibility, interoperability, reliability, maintainability, availability, logistic supportability, and training requirements), as well as the need for any modifications. In addition, OT&E provides information on organization, personnel requirements, doctrine, and tactics. It may also provide data to support or verify material in operating instructions, publications, and handbooks. OT&E will be accomplished by operational and support personnel of the type and qualifications of those expected to use and maintain the system when deployed, and will be conducted in as realistic an operational environment as possible, including enemy countermeasures. It will address operational performance of component systems, including new or improved components and their interaction with related existing systems. Costs directly related to operational testing in a program shall be planned and budgeted as a part of the total program costs.
1. OT&E will normally be conducted in phases, each keyed to an appropriate decision point.

- a. During the Alternative System Exploration Phase following Milestone 0, OT&E will be initiated, when appropriate, to assess the operational impact of the candidate technical approaches.
- b. During the Demonstration and Validation Phase, OT&E will be conducted, as necessary, to examine the operational aspect of selected technical approaches, and to provide information relative to projected operational effectiveness and suitability of the candidate system design concepts. In addition, such OT&E may provide inputs to decisions made at Milestone II or later to commit funds for long lead items or for limited production.
- c. During the Full-Scale Engineering Development Phase, following the Milestone II decision, adequate OT&E will be accomplished to provide a valid estimate of operational effectiveness (including vulnerability) and operational suitability (including compatibility, interoperability, reliability, maintainability, availability, logistic supportability, and training requirements).
- d. Subsequent to the Milestone III decision, OT&E will be continued as necessary to refine these estimates, to evaluate changes, and to re-evaluate the system to ascertain whether it continues to

meet operational needs and retains its effectiveness in a new environment or against a new threat.

2. In each DoD Component there will be one major field agency, separate and distinct from the materiel developing/procuring command and from the using command which is responsible for the conduct of OT&E and reports the results of its independent operational test and evaluation directly to the Military Service Chief and Service Secretary, or Defense Agency Director. The OT&E Agency will:

- a. Participate in planning of DT&E to ascertain what portion of DT&E will contribute to the accomplishment of OT&E objectives.
- b. Monitor and review the results of DT&E as necessary to obtain information applicable to OT&E objectives and to assess the readiness of the system for operational testing.
- c. Insure that the OT&E is effectively planned and conducted.
- d. Bring directly to the attention of its Military Service Chief and Service Secretary, or Defense Agency Director those program issues which impact adversely on the accomplishment of adequate OT&E.

- e. Provide to its Service Systems Acquisition Review Council (Sections IV.B.2. of reference (e) and III.I. of this directive) an assessment as to the results and adequacy of operational testing accomplished to date and the adequacy of operational testing planned for the future to support the Council's recommendations.
3. In addition, each DoD Component will provide within its immediate headquarters staff a strong, full-time, focal point organization to assist the independent OT&E field agency to keep its Military Service Chief and Service Secretary, or Defense Agency Director fully informed as to OT&E needs and accomplishments.
4. Test planning for DT&E and OT&E should be coordinated at the test design stages so that each test cycle requires minimum resources and yields the maximum data to satisfy the common needs of the material developing agency and the OT&E agency. Such coordination should also preclude unnecessary duplication. Development testing and operational testing may be combined where clearly identified and significant cost/time benefits would result, or where separation would cause delay involving unacceptable military risk or an unacceptable increase in the acquisition cost of the system. When combined testing is conducted, the necessary test conditions and test data required by both the developing agency and the OT&E agency must be realized. Therefore, the developing agency, through coordination with the OT&E agency, must insure that the combined test is so planned and executed as to provide the necessary operational

test information and that the OT&E agency is afforded the opportunity to participate actively in the test. The OT&E agency shall provide a separate evaluation of the resultant operational test information. As a normal practice the operational tests supporting a production decision will be conducted independently by the OT&E agency.

5. Acquisition programs shall be structured so that operational testing is commenced as early as possible in the development cycle. As a minimum, an initial phase of operational test and evaluation (IOT&E) will be accomplished prior to the first major production decision adequate to provide a valid estimate of expected system operational effectiveness and operational suitability. Preproduction prototypes will be employed for IOT&E if they are reasonably representative of the expected production items and allow a valid estimate to be made of expected system operational effectiveness and operational suitability; otherwise, pilot production items will be employed for IOT&E.
6. For complex systems, additional phases of OT&E may be required and performed with pilot or preproduction items subsequent to the first major production decision but prior to the availability of first production items. When production items are available in sufficient quantity, follow-on phases of OT&E adequate to meet the full objective outlined above will be accomplished by the appropriate DoD Component's independent OT&E agency.

7. For those systems which have an interface with equipment of another DoD Component, or may be acquired by two or more Components, joint OT&E will be conducted where required. Such joint testing will include participation and support by all affected Components as appropriate. An independent evaluation will be submitted by the OT&E agency of each participating Component.
 8. When required, and as initiated by the Deputy DDR&E(T&E), Joint Operational Test and Evaluation (JOT&E) programs will be conducted to evaluate the effectiveness of weapon systems, or of comparative weapon system technologies, under as realistic operational conditions as possible. Responsibility for managing the practical aspects of each JOT&E will be delegated to a specific Component, with supporting forces and materiel as required from other Components. When feasible, JOT&E objectives will be accomplished in conjunction with Service or JCS scheduled exercises.
- D. Test and Evaluation for Major Ships of a Class. The long design, engineering, and construction period of a major ship will normally preclude completion of the lead ship and accomplishment of test thereon prior to decision to proceed with follow ships. In lieu thereof, successive phases of DT&E and OT&E will be accomplished as early as practicable at test installations and on the lead ship so as to rapidly reduce risks and thereby minimize the need for modification to follow ships.

1. When combat system complexity warrants, there will be constructed a combat system test installation wherein the weapon, sensor, and information processing subsystems are integrated through their interfaces in the manner expected in the ship class. Adequate initial DT&E and OT&E of the integration of those subsystems will be accomplished thereon prior to the first major production decision on follow ships. To the degree practicable first generation subsystems will have been approved for service use prior to the initiation of integrated operational testing. Where subsystems cannot be service approved prior to the initial operational testing, their integration will be tested at the test site installation as early as possible in their acquisition cycle.
2. For new ship types incorporating major technical advancements not earlier proven in hull or non-nuclear propulsion design, a prototype incorporating these advancements will be employed. If the major technological advancements are contemplated in only some features of the hull or non-nuclear propulsion design, the test installation need incorporate only the applicable new features. Adequate test and evaluation on such prototype will be completed prior to the first major production decision on follow ships.

3. The prototyping of Navy nuclear propulsion plants will be accomplished in accordance with the methods in use by the Energy Research and Development Administration (ERDA). Construction of the lead and follow ships will be done in the sequence now being used.
4. For all new ship classes, continuing phases of OT&E on the lead ship will be conducted at sea as early in the acquisition process as possible for specified systems or equipments and, if required, full ship operational evaluation to the degree feasible.
5. A description of the subsystems to be included in any test site or test prototype, the schedules to accomplish test and evaluation, and any exceptions to the above policies will be set forth in the initial and any subsequent DCPs and approved by the Secretary of Defense.

E. Test and Evaluation for One-of-a-Kind Systems. For one-of-a-kind systems, or systems involving procurement of only a very few over an extended period, the principles of DT&E of components, subsystems, and prototype or first production models of the system will be applied. Compatibility and interoperability with existing or planned equipments will be tested. OT&E will be conducted as early as possible by the OT&E agency as necessary to provide a valid estimate of operational effectiveness and operational suitability.

- F. Production Acceptance Test and Evaluation (PAT&E). PAT&E is test and evaluation of production items to demonstrate that the items procured fulfill the requirements and specifications of the procuring contract or agreements. It is the responsibility of each DoD Component to accomplish the necessary PAT&E throughout the production phase of the acquisition process.
- G. T&E Master Plan (TEMP). The DoD Component shall prepare as early as possible in the acquisition process but no later than 120 days following the Demonstration and Validation Decision (Milestone I), an initial version of an overall test and evaluation plan. This broad plan should identify and integrate objectives, responsibilities, resources, and schedules for all T&E to be accomplished prior to the subsequent key decision points. The TEMP will be kept current by the DoD Component. All test and evaluation activities as prescribed by the TEMP shall comply with environmental issues in accordance with reference (c). The TEMP shall include consideration of electromagnetic compatibility in accordance with reference (d).
- H. Changes to Test and Evaluation Plans. The DoD Component will insure that any changes made in test plans after approval will be properly documented to show the reasons for change and the approving authority.

I. Defense Systems Acquisition Review Council (DSARC)/
Service Systems Acquisition Review Council ((S)SARC)/
Decision Coordinating Paper (DCP) Procedures for Major
Defense Systems. The DSARC/((S)SARC)/DCP procedures for the acquisition of major defense systems are described in detail in reference (e). The following paragraphs of this section amplify and supplement those portions of the reference which pertain to Test and Evaluation.

1. The DCP prepared for use at the time of the Demonstration and Validation Decision (Milestone I) for a major Defense System will identify the critical issues and areas of risk to be addressed by test and evaluation. It will also provide the test objectives and measures of effectiveness related to satisfaction of mission need, and a summary of schedules and resource requirements applicable to test activity prior to Milestone II. The DSARC, and/or (S)SARC, in its review will determine the adequacy of the critical issues, test objectives, and test schedules.
2. When the DoD Component proposes to initiate Full-Scale Engineering Development, the revised DCP will give the results of T&E accomplished to date; an updated statement of critical issues, test objectives, and areas of risk needing further assessment; a summary of performance criteria goals and thresholds; and an overview of test plans, milestones, and program interrelationships.

The cognizant Component shall make available supporting details of test plans and test results as requested by the Deputy DDR&E(T&E)(Section VI). The DSARC and/or (S)SARC will assess and comment to the Secretary of Defense as to the adequacy of T&E progress and of T&E planned to occur prior to the first major production decision.

3. The DSARC and/or (S)SARC in its review prior to the first major production decision will assess the results of testing to date and plans for future testing. To support a decision to proceed with production, it will comment to the Secretary of Defense as to the adequacy of these test results.
4. In case of DCP revisions and DSARC or (S)SARC reviews subsequent to the first major production decision, an updated assessment of test results, plans, objectives, and schedules for additional test and evaluation will be provided.
5. The DSARC and (S)SARC are supported at milestone reviews respectively by the Deputy DDR&E(T&E) and by Service development and OT&E agencies, who provide assessments as to the results and adequacy of testing accomplished to date and the adequacy of testing planned for the future to support the Councils' recommendations. In addition, the Deputy DDR&E(T&E) provides directly to the Secretary of Defense his independent assessment. This assessment is attached to the report of the DSARC

Chairman in the case of DSARC reviews, or to the assessment of the Defense Acquisition Executive when a DSARC review is not held.

IV. WAIVERS

Waiver of the accomplishment of the T&E as outlined in the approved DCP will be granted only by the Secretary of Defense.

V. EXCLUSIONS

Test and evaluation of nuclear weapons subsystems which are governed by other joint DoD/ERDA agreements are excluded from the foregoing provisions of this directive.

VI. RESPONSIBILITIES OF THE DEPUTY DIRECTOR OF DEFENSE RESEARCH AND ENGINEERING, TEST AND EVALUATION

The Deputy DDR&E(T&E) has across-the-board responsibility for OSD in test and evaluation matters. This responsibility includes:

- A. Reviewing test and evaluation policy and procedures applicable to the Department of Defense as a whole and recommending changes he believes appropriate directly to the Secretary of Defense.
- B. Monitoring closely the test and evaluation planned and conducted by the DoD Components for major acquisition programs and for such other programs as he believes necessary.
- C. Assisting in the preparation of, and/or reviewing, the Test and Evaluation Sections of DCPs and Program Memoranda (PMs).

- D. For major programs under DSARC review, reporting to the DSARC and the Worldwide Military Command and Control System Council, as appropriate, and directly to the Secretary of Defense his assessment as to the results and adequacy of the testing accomplished to date and the adequacy of testing planned for the future to support the recommendations of the DSARC. This independent assessment will be forwarded to the Secretary of Defense attached to the report of the DSARC Chairman.
- E. For major programs under (S)SARC review, participating in the OSD review of (S)SARC reports to the Secretary of Defense and reporting to the Secretary of Defense his independent assessment, attached to the assessment of the Defense Acquisition Executive.
- F. Monitoring closely such joint testing as is accomplished by the DoD Components in connection with their planned acquisition of specific systems. In addition, initiating and coordinating the accomplishment of such additional joint testing as is necessary, with specific delegation to an appropriate Component (or Components) of all practical aspects of the joint test.
- G. Initiating and coordinating Joint Operational Test and Evaluation (JOT&E) programs. In addition, monitoring the conduct of the JOT&Es and reviewing the JOT&E final reports.

- H. Coordinating and reviewing the test and evaluation of foreign systems for possible DoD or NATO-wide use.
- I. Fulfilling OSD responsibilities for the Major Range and Test Facility Base (MRTFB) in accordance with reference (f).
- J. Monitoring, only to the extent required to determine the applicability of results to weapon system acquisition or modification, that test and evaluation:
 - 1. Directed by the Joint Chiefs of Staff which relates to the Single Integrated Operational Plan (SIOP) operational factors.
 - 2. Conducted primarily for development or investigation of organizational or doctrinal concepts.

To accomplish these duties, statements of critical issues and test objectives, test plans, and test results will be made available to the Deputy DDR&E(T&E) as early as developed for such major or other programs as he may request.

VII. REPORTING REQUIREMENTS

The reporting requirements prescribed herein are exempt from formal approval and control in accordance with DoD Directive 5000.19, Enclosure 3, Section VII.C.

VIII. EFFECTIVE DATE AND IMPLEMENTATION

This Directive is effective immediately. Each DoD Component which has authority and responsibilities under reference (b) will review its documents which implement this Directive and

will forward to the Director of Defense Research and
Engineering within 120 days three copies of each document
published or revised as a result of this Directive.

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